11. For example, in the FCC Competitiveness Study the Commission takes the position that long-distance business services became more competitive in the late 1980s and early 1990s as indicated by the relative growth of MCI and Sprint. If this were true, then more competitive prices and service offerings should be observed for this period. As markets became less concentrated, increasing competitive pressure from the second and third sources of supply should have reduced price-cost margins, lowering profit returns and capital values for investors. None of this occurred. Other theories of firm behavior than the "competitive" theory are need to explain the observed relationships between margins and concentration in long-distance.[9]

12. The price-cost margins of AT&T, MCI, and Sprint in markets for the major classes of long-distance service have increased in the past several years as concentration has fallen. Further, these price-cost margins have been lower for services purchased by more price-sensitive buyers, as would be expected under oligopolistic or monopolistic price-discrimination. Changes in stock prices of the major suppliers have supported the hypothesis that major pricing decisions in long-distance service markets by AT&T caused all three to gain profits. Actual patterns of behavior for interLATA services have been consistent with the proposition that these firms keep prices above marginal costs through strategies that eliminate competition.

13. The development of these findings is organized as follows. Section II reviews changes in market structure since the AT&T divestiture of 1984 and how these changes affect price setting. Section III discusses alternative competitive and noncompetitive theories used to characterize firm behavior. Section IV presents studies of concentration and pricing in various markets that test these theories and Section V presents conclusions from the evidence on the lack of competition in interLATA markets.

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[9] As discussed in greater detail below, the three relevant theories are known as Bertrand, Cournot, and tacit collusion. *See* DENNIS CARLTON & JEFFREY PERLOFF, MODERN INDUSTRIAL ORGANIZATION, ch. 7 (Harper Collins College Publishers, 2d ed. 1994).

II. Supplier Concentration in Long Distance Markets Declined Substantially in the 1984-89 Period, But Stabilized at High Levels in the 1990-93 Period

14. The number and relative sizes of the firms in a market determine the "concentration" in that market. There are many ways to specify or index concentration. Here I make use of the Herfindahl-Hirschman Index (HHI), equal to the sum of the squared shares of firm sales, because this index enables one to make comparisons to an "equivalent" number of equal-sized firms when market shares are not in fact equal. The HHI varies from one to (nearly) zero, with one indicating that a single firm makes all the sales and zero indicating that an infinite number of firms is present. The HHI can be converted into the number of equivalent, equal-sized firms consistent with that level of concentration simply by taking its reciprocal -- an HHI of 0.5 is consistent with two equal-sized firms, and an HHI of 0.33 is consistent with three equal-sized firms.

15. Before estimating the HHI for specific long-distance service markets, an overall perspective should be considered. The individual shares of total toll service revenues for the three major interexchange carriers over the period 1984-89 are shown in the table below. During this period, AT&T's share falls while MCI's and Sprint's shares rise, for reasons that are reviewed below. Subsequently, I discuss how in the period 1990-93 the market shares of AT&T, MCI, and Sprint stabilize: there is a "break" in the reallocation of shares that had increased the relative size of the second and third firms. After discussing the reasons for this new-found stability in shares, I review and analyze market concentration using HHI series for four specific services: message toll service (MTS), outbound wide-area telecommunications services (WATS), inbound WATS (800 service), and Virtual Network Services.

AT&T, MCI, AND SPRINT
MARKET SHARES (%) OF TOTAL TOLL REVENUE

	AT&T	MCI	Sprint
1984	91	5	3
1985	88	6	3
1986	84	8	4
1987	81	9	6
1988	78	11	7
1989	71	13	9
1990	68	15	10
1991	67	16	10
1992	65	18	10
1993	65	19	10

Excluding resellers.
Source: FCC, Long-Distance Market Shares, Fourth Quarter (1993), Tables 5 and 6.

A. *AT&T's Share of Service Offerings Declined Over the Period 1984-89*

16. Before and immediately after the AT&T divestiture, incentives for other suppliers to expand their shares of the long-distance business were substantial. For at least ten years before divestiture, AT&T had in place a regulated tariff with high price-cost margins for long-distance service where the high margins were the result of a policy to generate income specifically to cover system-wide fixed costs that were common to both long-distance and local service. The percentage difference between the price and incremental direct cost of a long-distance call increased substantially, while the same percentage difference for local calls fell.

PRICE-COST MARGINS FOR
LONG-DISTANCE AND LOCAL CALLS ON AT&T[10]

Year	Long-Distance	Local
1964	8.2%	56.3%
1977	73.6%	25.9%

The percentage of common costs covered by revenues collected from interstate MTS and WATS in this arcane process increased steadily from six percent in 1955 to 32 percent in 1978.[11] This shift of margins was made possible by allocating more of the fixed costs of the system to be covered by the long-distance revenues. The AT&T rate structure provided a strong incentive for rival firms to enter long-distance services, to offer similar services at lower margins, and to build market share. Since these other firms would not (and did not) incur the necessary "tax" of contributions to cover the local line and switching costs of the Bell System, they profited from just undercutting the high long-distance margins. At the time of divestiture in 1984, AT&T's prices were approximately 20 percent higher than those of MCI and Sprint.

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[10] The Historical Cost Study, Defendants' Ex. D-T-427, United States v. American Tel. & Tel. Co., 552 F. Supp. 131 (D.D.C. 1982). The price-cost margin for long-distance is based on the average price of a long-distance call and the incremental direct cost of a long-distance call; the price-cost margin for local service is based on the annual price of local service and the incremental direct costs of local service.

[11] MacAvoy & Robinson, *Winning By Losing*, *supra* note 1, at 7. Roger Noll and Susan Smart also make this point: "Between the late 1960s and 1984, the fraction of non-traffic-sensitive local exchange costs paid from long-distance revenues increased from 10 to 26 percent, at which time the FCC froze the federal share at 25 percent. Had [the Ozark separations plan] not been in place, by the early 1980s nearly another dollar per month of local exchange costs would have been collected somewhere else in the price structure, and most probably in large measure from the basic monthly rate." Roger Noll & Susan Smart, *Pricing of Telephone Services*, *in* AFTER THE BREAK-UP: ASSESSING THE NEW POST-AT&T DIVESTITURE ERA 88 (Barry Cole, ed., Columbia University Press 1991).

17. Even after divestiture, MCI and Sprint had further incentive to expand market share. Regulatory policy on charges for access to local exchange favored expansion of other common carriers. Under the MFJ, AT&T was required to pay local exchange carriers (LECs) higher rates for its access connection than MCI and Sprint paid for their less-than-equal access connections.[12] With AT&T's rates set higher than those of the other common carriers (OCCs), the OCCs' market shares rose rapidly. MCI's share of total toll service increased from five to thirteen percent from 1984 to 1989, while Sprint's share rose from three to nine percent in this period.[13] These increases suggest that the FCC's rate differential more than compensated consumers for inferior access,[14] and indeed was so large as to induce many customers to take MCI's and Sprint's combination of lower rates and inferior access over AT&T's higher rates and superior access. AT&T's market share of total toll revenues declined from 91 percent in 1984 to 71 percent in 1989.[15] (The portion of this market-share loss that is not accounted for by the growth in market shares for MCI and Sprint can be attributed to the expansion of regional facilities-based carriers, such as Allnet, Cable and Wireless, and Williams Telecommunications Group.)

18. In response AT&T filed requests with the FCC seeking to lower rates, but MCI and Sprint used the regulatory process to block or delay AT&T's proposals.[16] For example, when

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[12] For example, in 1983 specialized common carriers paid an access charge only 45 percent that of AT&T's charge. MacAvoy & Robinson, *Winning By Losing*, *supra* note 1, at 34. This same percentage discount held through 1987 for less-than-equal access connections.

[13] FEDERAL COMMUNICATIONS COMMISSION, STATISTICS OF COMMUNICATION COMMON CARRIERS tbl. 1.4. (1992-93 ed.) [hereinafter 1992-93 COMMON CARRIER STATISTICS]. The market shares are calculated after deleting the category "others" from total revenues for long distance carriers. This is done to exclude non-facilities-based carriers, that is, resellers. Resellers do not affect market structure because they only repackage services offered by facilities-based carriers so as to exploit arbitrage opportunities.

[14] *See* MacAvoy & Robinson, *Losing By Judicial Policymaking*, *supra* note 1, at 251.

[15] 1992-93 COMMON CARRIER STATISTICS, *supra* note 11, at 1.4.

[16] The FCC well recognized this abuse of regulation. Former Chairman Alfred Sikes stated that competitors used "the regulatory process to block price reductions potentially offered by

AT&T applied to revise its Tariff 12 offerings, MCI and Sprint filed petitions to reject or suspend the revisions. In its petition, "MCI states that AT&T's cost support materials are incomplete and imprecise, and fail to justify AT&T's abandonment of its right to higher prices from customers under existing contracts for integrated offerings by proposing significant price reductions."[17] In general, the FCC approved AT&T's proposed revisions and AT&T's prices did decline during the 1984-89 period, but only when justified by cost changes and indeed not by as much as its documented cost decreases. When the FCC shifted access charges from long-distance users to local service, AT&T's costs declined by $9.313 billion from 1984 to 1989, while its rates declined only by $7.769 billion over the same period.[18]

19. In effect, AT&T had to take relatively high price-cost margins, with falling costs, and had to allow rate differentials to develop with MCI and Sprint on the same services. But after some time access charges paid by these other interexchange carriers equalized with those paid by AT&T (due to the spread of equal access from equipment installation), and the rate differentials between AT&T and the OCCs narrowed from approximately 10 to 20 percent in 1984 to four to five percent in 1987-89.[19] By 1990, AT&T's prices were still at higher than

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AT&T . . . [T]his holds prices artificially higher, and reduces customer choice." Federal Communications Commission Communications Common Carrier Programs: Before the House Subcommittee in Telecommunications and Finance, Committee on Energy and Commerce, 102d Cong., 1st Sess. (June 19, 1991) (statement of Alfred C. Sikes, FCC Chairman), 1991 FCC LEXIS 4212.

[17] AT&T Communications, Revisions to Tariff F.C.C. No. 12, 4 F.C.C. Rcd. 5430, 5431 (1989).

[18] WILLIAM TAYLOR, EFFECTS OF COMPETITIVE ENTRY IN THE U.S. INTERSTATE TOLL MARKETS: AN UPDATE tbl. 1 (National Economic Research Associates 1992).

[19] MICHAEL E. PORTER, COMPETITION IN THE LONG DISTANCE TELECOMMUNICATIONS MARKET: AN INDUSTRY STRUCTURE ANALYSIS 11-12 (Monitor Co. 1987).

competitive levels, but the OCCs priced their services just below the "umbrella" that the tariffs filed by AT&T provided as a matter of course.[20]

B. ***Market Concentration Stabilized Over the Period 1990-93***

20. After 1990, AT&T's share of total toll revenues was much more stable than previously, falling only from 68 percent in 1990 to 65 percent in 1993, approximately one to two percent per year.[21] MCI's overall share rose from 15 percent in 1990 to 19 percent in 1992, while Sprint's share remained constant at 10 percent from 1990 to 1993.[22] This stabilization of shares is reflected in the HHI series, which declines until 1989, when there is a discontinuity or "break," after which the HHI is constant. The dashed line in the figure below indicates what the HHI would have been had the trend based on the period 1985-89 continued in the 1990s.[23]

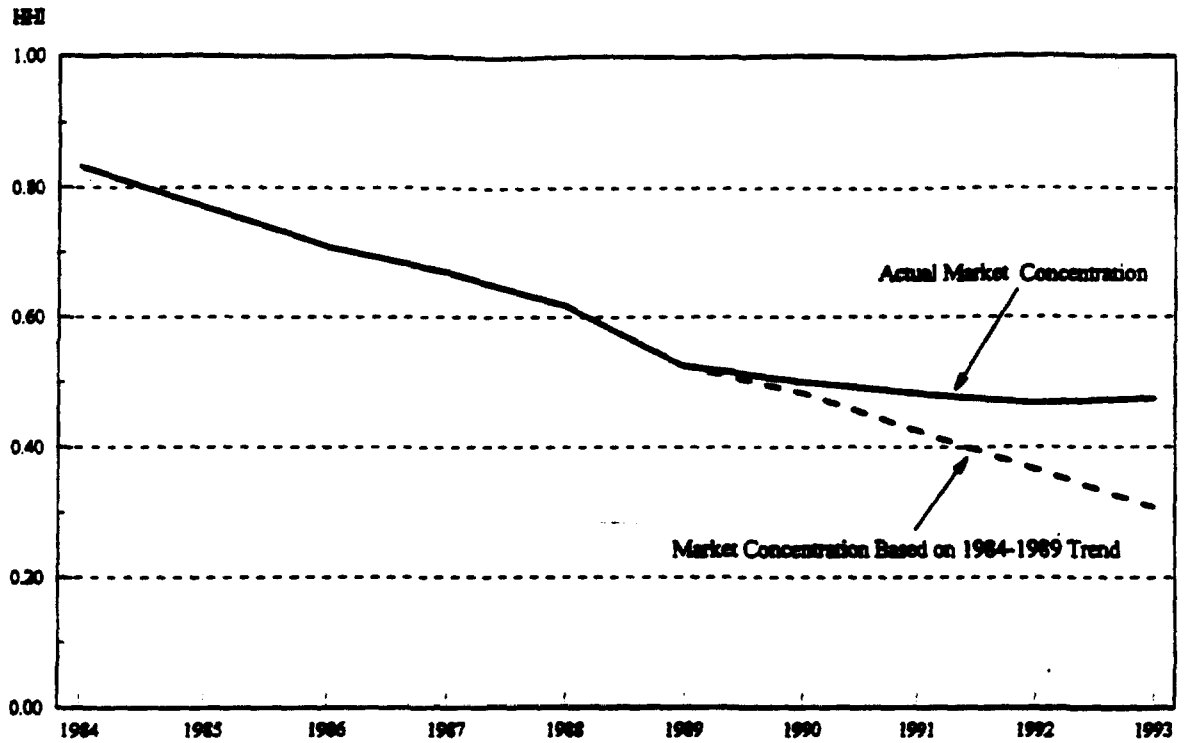
[20] *See* MacAvoy & Robinson, *supra* note 1, at 227, 258-59.

[21] 1992-93 COMMON CARRIER STATISTICS, *supra* note 11, at tbl. 1.4.

[22] *Id.*

[23] The trend is calculated from a simple linear regression of the HHI on a time variable. The data on market concentration are obtained from FEDERAL COMMUNICATIONS COMMISSION, LONG DISTANCE MARKET SHARES tbls. 5, 6 (3d quarter 1993). As with the market shares reported previously, resellers are eliminated from the HHI calculations. For 1993, this is done by multiplying (1) the 1992 percentage of revenues classified by the FCC as "other" by (2) the 1993 total toll revenues. This calculation yields an estimate of 1993 total toll revenues net of resellers.

THE DECLINE AND STABILIZATION OF MARKET CONCENTRATION
(TOTAL TOLL SERVICES)



21. There are numerous explanations for this new-found stability in market shares after 1989. The most direct is that changes in regulation took place in 1989, when the FCC instituted the Price Cap Program for AT&T,[24] which changed the way AT&T set prices. This program replaced tariff rate levels based on average historical costs with price levels adjusted for inflation and productivity (cost) changes. AT&T price caps were in place for three categories of services: Basket One for residential and small business services (or what is known as message toll service), Basket Two for 800 number calls (or inbound WATS), and Basket Three for large business (outbound WATS) and all other AT&T business lines (including Virtual Network). In November 1991, Basket Three caps were eliminated and replaced by allowing AT&T to make filings of any price change with automatic 14-day approval (except for those involving service on

[24] Policy and Rules Concerning Rates for Dominant Carriers, Report and Order and Second Further Notice of Proposed Rulemaking, FCC 89-91, 4 F.C.C. Rcd. 2873 (1989).

analog private lines). In May 1993, Basket Two caps were eliminated in favor of allowing AT&T to make the same type of filings, except for 800 directory service. Basket One price caps remain in place as shown in the table below.[25]

FCC PRICE-CAP PROGRAM FOR AT&T

Price-Cap Basket	Services	Regulatory Status
Basket One	MTS (Message Toll Service)	Price Cap in Effect
Basket Two	800 (Inbound WATS)	Streamlined Tariffs as of May 1993, except for Directory 800
Basket Three	Outbound WATS, Virtual Network Services, and Other Switched and Private Line Services	Streamlined Tariffs as of November 1991, except for private line analog

22. These new regulatory procedures also established that AT&T's price cuts in reaction to other suppliers would be determined by the company, at least within a range between fairly broad floors and ceilings. The range was established with the intent of providing AT&T an incentive to economize on costs, while preventing possible predatory price cuts. Within each of the three baskets, several service categories were established. For example, Basket One had six service categories consisting of (1) domestic day, (2) domestic evening, (3) domestic night/weekend, (4) international MTS, (5) operator and credit card services, and (6) Reach Out America. The Commission determined that in order to obtain streamlined review of rate changes, AT&T could not increase or decrease rates for a service category by more than five

[25] Price Cap Performance Review for AT&T, Report, CC Dkt. No. 92-134, 8 F.C.C. Rcd. 6968, 6972-73 (1993).

percent per year, after adjusting for the percentage change in the price-cap index.[26] If AT&T proposed a rate increase that exceeded an upper service-band index, it would have to provide ninety-day notice and support the rate request with substantial cost and revenue data. If AT&T proposed a rate decrease below a lower service-band index, it would have to provide forty-five day notice and cost and revenue information demonstrating that the lower rate would cover the average variable cost of the service. Thus, the price-cap plan provided AT&T streamlined rate treatment to increase or decrease rates for services in specific service categories by five percent per year relative to the price cap index, as well as the ability to further increase or decrease rates upon a sufficient showing of costs and revenues. In particular, since the average variable costs of long-distance service are low relative to rates, as shown in Section IV, AT&T had substantial pricing flexibility to reduce rates to discipline MCI and Sprint for any strategic actions to shift market share. AT&T's ability to credibly threaten MCI and Sprint with rate decreases after July 1989 could sustain market shares.[27]

23. The FCC considers the Price Cap Program a success. In its 1993 review of the program, the Commission determined that AT&T's prices fell according to Basket One and Two tariffs; AT&T's infrastructure improved; service quality as measured by the "Equipment Blockage and Failure Index" remained "about the same or slightly better"; and AT&T introduced new services.[28] The evidence reported below on price-cost margins, however, indicates that competitive forces have *not* operated as stated by the FCC. MCI and Sprint have followed

[26] A four percent cap applied to domestic evening and domestic night/weekend. 4 F.C.C. Rcd. 3054 (1989).

[27] As discussed in Section III, in modern game-theoretic analyses of the behavior of oligopolies, the ability to threaten in a credible manner plays a central role in determining observed profit margins. *See generally* DREW D. FUDENBERG & JEAN-JACQUES TIROLE, GAME THEORY (MIT Press 1991).

[28] Price Cap Performance Review for AT&T, 8 F.C.C. Rcd. 6968, 6969 (1993).

AT&T's lead since 1990 in raising prices, and the three companies' price changes have been so close that the price gap of the 1980s has all but disappeared.

C. *Market Concentration by Line of Business*

24. The market shares discussed in the previous two sections relate to total toll revenues. It is clearly preferable to examine more disaggregated services because many different services included in total toll revenues in reality constitute different "market" services. Services in different economic markets are as follows:

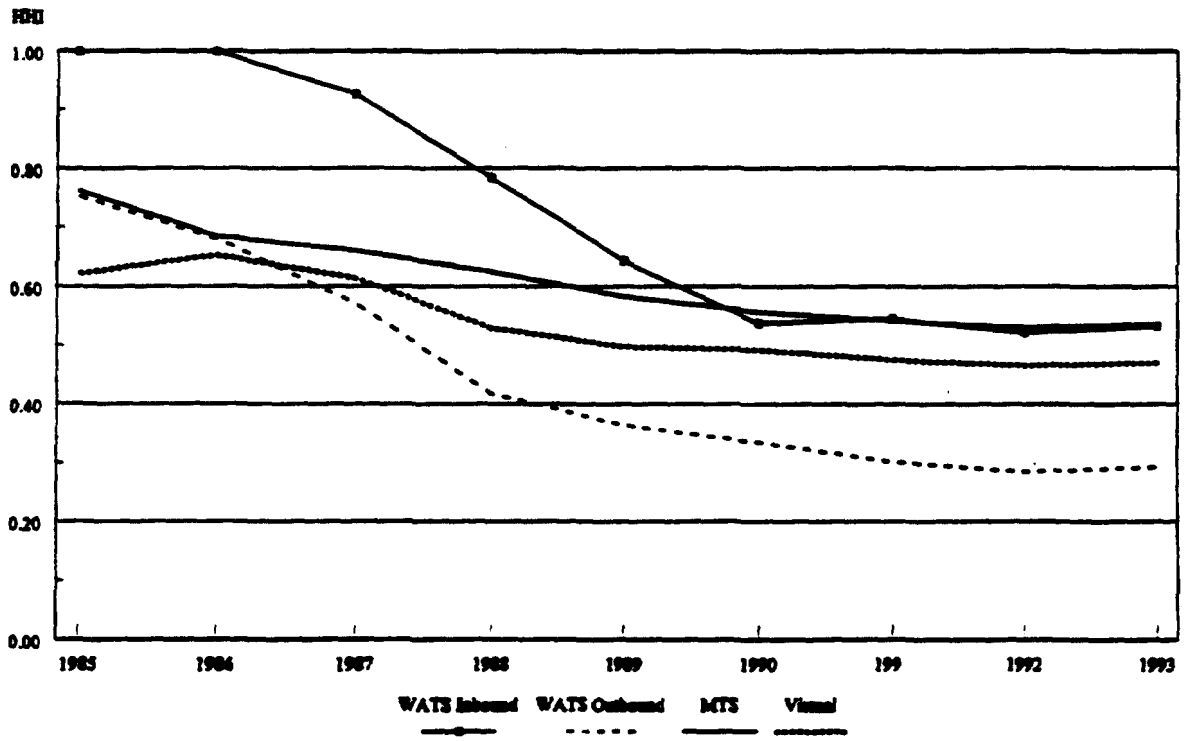
- *Message Toll Service:* offerings generally purchased by residential and small businesses consumers.
- *Outbound WATS:* services by which business customers place long-distance voice or data calls using either switched or dedicated access. Billing is based on a bulk rather than an individual call basis.
- *Inbound WATS (800 Service):* service that allows business customers to receive long-distance voice or data calls using either switched or dedicated access. Inbound WATS is not a substitute for outbound WATS services to any extent because it is designed to allow businesses to receive requests from customers for final goods or services, whereas outbound is designed to allow businesses to place calls for a wide variety of input related services.
- *Virtual Network Services:* services provided to bulk business customers using the common carrier switching facilities as a user network indistinguishable from that of a facilities-based switched private network.[29]

Revenue shares HHI series have been constructed for MTS, outbound WATS, inbound WATS (800 services), and Virtual Network Services on a disaggregated basis with switched differentiated from dedicated service offerings.

[29] Virtual Network services are outbound rather than inbound. That is, they are designed to allow large-volume customers to place calls.

25. Such measures for specific services have not previously been analyzed in long-distance services because data for specific services have been partial and highly aggregated. The data used in this analysis were obtained from Multinational Business Services, Inc., which compiled much more complete series on such service by company from filings made with the FCC and state public utilities commissions, corporate reports, Wall Street analysts' reports, academic publications, interviews with corporate officials, and information obtained from federal and state regulatory agencies through Freedom of Information Act requests. The resulting market concentration statistics for MTS, outbound WATS, inbound WATS (800 services), and Virtual Network Services are shown in the figure below.

THE DECLINE AND STABILIZATION OF MARKET CONCENTRATION[30]



[30] The HHIs for the 1985-90 period are based on firm revenues from MULTINATIONAL BUSINESS SERVICES, INC., INTEREXCHANGE COMPETITION IN THE PRICE CAP ERA: A QUANTITATIVE ANALYSIS BY MAJOR CARRIER, SERVICE, AND MARKET BASKET at B-1 to B-8. The HHIs for the 1991-93 period are forecasted from a regression model using revenues for total toll service as reported in LONG DISTANCE MARKET SHARES, *supra* note 21, at tbls. 5, 6. (HHIs for 1993 are reported as of the third quarter.)

26. Trends in the HHI from company revenues for specific categories of long-distance service vary widely, although the HHIs in all categories show declines in concentration. The HHI index for MTS is initially at 0.76 (or the equivalent of 1.3 equal-sized firms) and declines to a level of 0.54 (the equivalent of 1.9 equal-sized firms). The HHI for inbound WATS (800 services) begins at 1.0 in 1985, because AT&T was the only carrier offering 800 services at that time, falls rapidly and then stabilizes at 0.53 (1.9 equal-sized firms) by 1993. The HHI for outbound WATS begins in 1985 at a level of 0.75 (1.3 equal-sized firms), falls relatively rapidly to 1988, and then stabilizes at 0.29 (3.4 equal-sized firms).[31] The HHI series for outbound WATS is consistently below that for inbound WATS. Finally, the HHIs for virtual private networks, increase from 1985 to 1986, but then decline gradually from a level of 0.65 to 0.47 (the equivalent of 2.1 equal-sized firms).

27. With the exception of MTS, the HHI series generally indicate "breaks" in downward trends at some point during the 1989-90 period. This change in the trend of concentration plays an important role in establishing the basis for hypotheses about competitiveness in pricing in the 1990s in contrast to hypotheses about the same type of behavior in the 1980s. For MTS, there is no substantial break over the entire period, but the reduction in HHI from 1985 through 1993 is equivalent only to the introduction of one-half an identical-sized firm so that concentration is constant at a level implying the existence of only one and one-half sources of supply throughout.

[31] The HHI for outbound WATS for the period 1991-1993 is calculated from assuming the same trend behavior as for the total toll services. This assumption causes the HHI for outbound WATS to decline from 0.33 in 1990 to 0.29 in 1993. This would imply that AT&T's market share declined by as much as one-fourth in that period. Such a decline, in my view, is extremely unlikely. It is more likely that the HHI for outbound WATS is currently in the range of 0.3 to 0.4, but specific data to indicate that are not available after 1990.

III. THE MARKET BEHAVIOR FOR INTERLATA SERVICES IS CHARACTERIZED BY TACIT COLLUSION

A. *Hypotheses About Price Behavior When There Are Few Sources of Supply*

28. In an industry dominated by a few firms, each with a large market share, one firm's sales depend on the actions of its rivals as to pricing and distribution of services. Firms must be aware of rivals' actions and reactions, because such actions affect the extent of demand for services from the individual supplier. When firms do consider rivals' behavior in determining their own demands, "oligopolistic" conditions are present in the market. Long-distance telephony has a number of oligopolistic markets. AT&T, MCI, and Sprint together constitute more than 80 percent of long-distance capacity and revenues. At the time of divestiture, the three firms accounted for 98 percent of toll revenues; by 1993, this share had slowly declined to 87 percent as a few small facilities-based firms gained shares over the ten-year span, but these three large firms remain collusively dominant compared to a fringe of other suppliers. Furthermore, resellers are limited in providing service by their access to the capacity of AT&T, MCI, and Sprint, so that they cannot provide net additions to supply so as to affect the overall levels of market prices.

29. Economic theories of pricing in oligopolistic markets can be divided into two classes based on assumptions made about firm behavior. In assuming noncooperation in pricing among firms, each operates to best their rivals and prices reflect this process to some extent. Under an assumption that firms cooperate, the rivalrous process is eliminated and firms collude. But the implications for prices are not always distinctive. As Carlton and Perloff state: "In a *cooperative game* firms make binding agreements to coordinate or form a cartel. In a *noncooperative game*, firms cannot make binding agreements, so they act independently; however, the cooperative outcome may be obtained."[32] Since cooperative pricing is more

[32] CARLTON & PERLOFF, *supra* note 7, ch. 7.

profitable than independent pricing, others things being equal, tacit collusion may be the goal even in a noncooperative framework.

30. Given noncooperative behavior, there are also two approaches to developing a theory of price and output behavior: conjectural variation and game-theoretic models. These approaches differ in how the resulting models predict rivals' behavior and thus in how they formulate expected pricing outcomes. Each approach has strengths and weaknesses, but the position taken here is that the conjectural variation approach provides insights into market performance in telecommunications.

31. In the earliest approaches to noncooperative behavior, based on conjectural variation, each firm has a conjecture (or guess) about how its rivals will respond to changes in its price or output decisions. Based on its conjecture, each firm chooses price or output to maximize its own profits. The conjectures remain unrealistically fixed, so that one assumes that rivals hold to a constant level of output or price, despite one's own output and price changes. Even though such an assumption seems unrealistic in describing interactive firm behavior, it yields testable hypotheses on the extent of competition in a market.

32. Within the last twenty years, economists have increasingly used game-theoretic approaches to overcome the apparent weaknesses of the conjectural variation theories in making assumptions descriptive of rivals' actual interaction in oligopolistic markets.[33] In game theory, a firm's strategy can change over time, so that firms interact with one another through changes in their price, output, and advertising policies. In addition, firms engage in threats and retaliatory behavior toward rivals. Although this framework assumes behavior more in line with observable

[33] In contrast to the conjectural variation theories of oligopoly, which were derived in the nineteenth century, the pioneering work in game theory (from which games of oligopolistic pricing subsequently were derived) was done only 50 years ago. *See* OSCAR MORGENSTERN & JOHN VON NEUMANN, THEORY OF GAMES AND ECONOMIC BEHAVIOR (Princeton University Press 1944).

interactions, it yields multiple propositions about resulting behavior that are weak in providing testable hypotheses on actual pricing.

33. Characteristic of conjectural variation models are those of Cournot and Bertrand,[34] which cover one period, assume identical services from all suppliers, and no new entry into the market. Each firm has a conjecture about how its rivals would respond to changes in its behavior (a *conjectural variation*); and based on that conjecture, that firm chooses its output or price to maximize its profits. In the Cournot approach, the firm chooses its most profitable output level on the assumption that its rivals will hold their outputs constant. In the Bertrand approach, each firm sets its most profitable price on the conjecture that other firms will maintain their current prices.

34. The Cournot framework implies that the price in the market is between the monopoly and perfectly competitive price levels, depending on the number of equal-sized firms providing service in the market. As the number of such firms increases, the Cournot price moves down to the competitive level, so that declines in market concentration lead to lower price-cost margins. In contrast, the Bertrand framework results in a competitive pricing outcome whenever the number of firms is two or more, because each firm charges a price (exceeding its marginal cost) that undercuts the common fixed price of all of its rivals. By choosing a price slightly below its rivals, who are assumed not to change their prices, each firm simultaneously reduces the price level until it falls to marginal cost. This process occurs regardless of whether there are few or many firms, or whether concentration is high or low, and the result is the same as the competitive process.

35. The following table illustrates Cournot and Bertrand equilibria relative to monopoly price, based on simplifying assumptions. For the illustrative example used, when there are two firms, the Cournot price-cost margin is 20 percent below the monopoly level and

[34] A. COURNOT, RECHERCHES SUR LES PRINCIPES MATHEMATIQUES DE LA THEORIE DES RICHESS 67 (1838); J. Bertrand, *Theorie Mathematique de la Richesse Sociale*, JOURNAL DES SAVANTS 499 (1883).

industry output is 33 percent above the monopoly level. As the number of firms increases, the price-cost margin approaches zero -- the level in perfect competition. The Bertrand price-cost margin is zero with two or more firms.

EQUILIBRIA FOR MODELS OF OLIGOPOLISTIC COMPETITION

Oligopoly Model	Number of Equal-Size Firms	Price-Cost Margin (as percent of monopoly)	Profit (%)		Output (%)	
			Firm	Industry	Firm	Industry
Monopoly	1	100	100	100	100	100
Cournot	2	80	44	89	67	134
	3	66	25	75	50	150
	4	56	16	64	40	160
	5	50	11	55	33	165
	10	30	3	33	18	180
	100	4	0	4	2	200
Bertrand	2	0	0	0	0	200

Adapted from CARLTON & PERLOFF, *supra* note 7, ch. 7. Specific assumptions used in this analysis: market demand ($) P = 3 - Q; firm's cost function ($) C(q) = q.

36. The Cournot and Bertrand concepts are highly limiting abstractions of actual behavior, since they assume unrealistic responses to rivals' actions. They may make sense in a market in which there is only one period in which transactions take place. But these concepts are not realistic in the sense that they assume that a firm will keep the same conjecture even after its rivals have changed their behavior in the course of repeated rounds of transactions. The Cournot and Bertrand approaches do generate predicted pricing patterns, however, that can be compared

with those in long-distance markets. In the Cournot framework, as concentration declines (or as the equivalent number of equal-size firms increases), price-cost margins fall. In the Bertrand framework, price-cost margins are always zero, as long as the number of firms is at least two. Actual markets should reveal one or the other of these patterns as concentration declines unless the firms practice noncompetitive pricing.

B. *Tacit Collusion in Oligopoly*

37. There is another important conceptual framework in which the few firms constituting an oligopoly can act independently, yet ultimately produce the same price as in a collusive context.[35] Through recognized interdependence, firms operating individually can exercise market power to set price at a level maximizing joint profits but without any explicit, formal agreement to fix prices. They do this by foregoing individual policies to price discount so as to gain share, in favor of accepting a stable market share. By doing so each firm is in a position to set the same profit-maximizing price on its own. When sellers are few and certain other conditions are present these policies of each firm make explicit agreement unnecessary to keep prices above competitive levels.

38. The conditions necessary to support such noncompetitive pricing include: uniform products or services, uniform firm cost levels, and barriers to entry. Product differentiation would result in a conflict among firms on what constitutes the joint maximizing price. Low-cost firms would want to set a lower price, while high-cost firms would seek a higher price level, and the low price would prevail, shifting market share to those firms. Resulting conflicts would be difficult to reconcile without direct collusion.

39. But the most important requirement is that firms agree to accept some set of stable market shares and develop credible threats of retaliation to prevent one firm from engaging in

[35] JAMES W. FRIEDMAN, OLIGOPOLY AND THE THEORY OF GAMES (North-Holland 1977).

price cutting.[36] Since stable market shares determine the credibility of the process, they have to be determined by demonstrated policies by which a large firm would make it clear it would discipline smaller ones if they use discounts to gain shares. Suppose a market is dominated by a firm with a large market share (say, in excess of 80 percent) and contains several small firms with low market shares (for example, less than five percent). Given these relative shares, and with the dominant firm's price realizable on a large volume of sales, the dominant firm cannot credibly threaten its rivals with large price reductions. The smaller rivals know that the dominant firm can earn more by maintaining its margins. The dominant firm lacks credibility in threatening to retaliate, and thus eliminate one of the market conditions that makes it profitable to practice tacit collusion.

40. When market shares greatly differ among firms, so that one or two firms are much larger than the rest, it is likely that Cournot or Bertrand behavior will dominate. If that were the case then the dominant firm's market share will fall over time. As market shares equalize, the dominant firm's threat to cut prices to halt its loss of customers becomes credible. Furthermore, as small firms grow, they earn higher profits from their existing customer base and place a commensurably lower value on profits that depend on increasing their market shares. The dominant firm is able to credibly threaten low prices to support tacitly collusive outcomes.

41. As market shares tend to converge over time to stable levels, firms can succeed in tacitly collusive pricing when they could not do so earlier. Stabilization of shares enhances their ability to set tacitly the higher price level. One factor that prevents firms from tacitly colluding is the difficulty of diagnosing why market shares have realigned. When firms disagree on "appropriate" shares, they encounter difficulties in producing a narrow range of similar prices.

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[36] Daniel Orr & Paul W. MacAvoy, *Price Strategies to Promote Cartel Stability*, 32 ECONOMICA 186 (1965). Simple but rather general conditions are given in Table Two of this study: when there are three equal-sized firms, or their equivalent (that is, HHI = 0.33), then tacit collusion is unstable as long as price discounting by any one firm to gain share takes more than one production period for the others to respond, or when the market expands rapidly with a price cut so that it is difficult to distinguish cuts from market expansion.

But as market shares tend to be stable and at more equal levels, asymmetries in strategy on shares diminish, enhancing the ability of firms to perceive uniformly how market demand should be divided.

42. When realized, these considerations enable each firm to set approximately the monopoly price, notwithstanding that three or more firms provide the same services in a well-defined economic market. Consider first a pattern of monopoly pricing across markets.

43. A monopolist sets its price-cost margin equal to the reciprocal of the elasticity of demand.[37] If customers can more readily substitute away from the monopolist's service, their demand will be more elastic. If so, the monopolist must keep its price-cost margin low to those customers or they will switch to another market. Conversely, if customers have few opportunities to switch to other services, their demands will be less elastic and the monopolist can earn higher profit margins from charging them a higher price. These basic results are illustrated below, with margin in a realistic range. (The illustration below assumes that all elasticities of demand exceed one (in absolute value) because a monopolist can always earn higher profits by raising its price to move out of the inelastic portion of the market demand curve.)

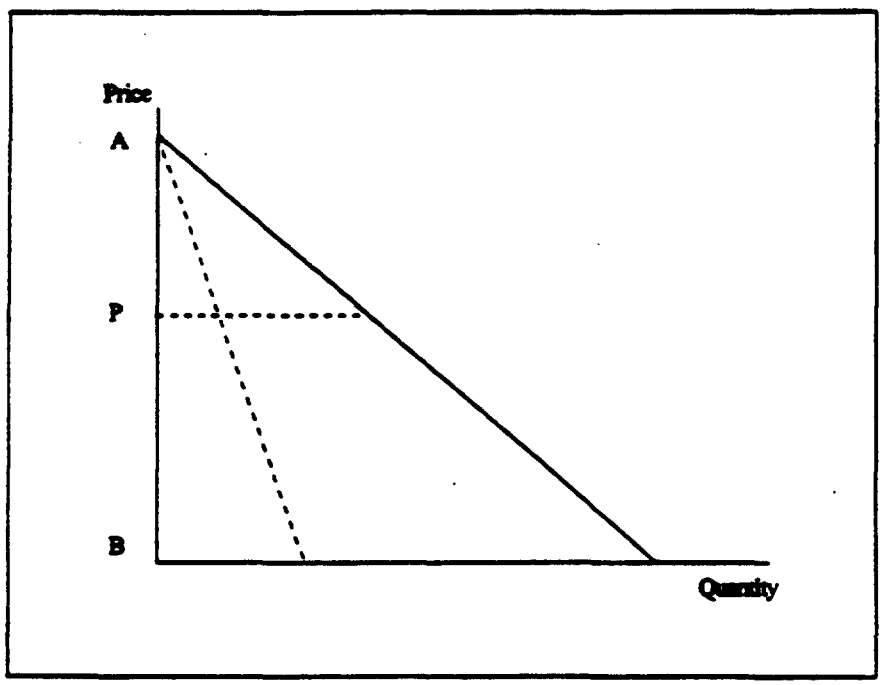
MONOPOLIST'S PRICE-COST MARGINS FOR
DIFFERENT ELASTICITIES OF DEMAND

Price-Cost Margin	Elasticity of Demand
0.67	-1.5
0.50	-2.0
0.33	-3.0

[37] *See, e.g.*, M. WATERSON, ECONOMIC THEORY OF THE INDUSTRY 23 (Cambridge University Press 1984).

44. Suppose there are three firms with stable shares of a uniform good or service in a market in which there are credible penalties for discounting to increase share. If firms have similar marginal costs, their initial profit-maximizing prices tend to be the same. This is illustrated for three firms whose market shares have converged to the same percentage, so that each has one third of the sales. Then the demand curve facing each firm will be approximately one-third of the market demand curve. This demand function is shown below as the dashed line and the market demand is shown as the solid line.

FIRM AND MARKET DEMAND CURVES



45. The elasticity of demand (in absolute value) at the indicated price by definition equals the ratio of PB/AP. This ratio is the same at any price on the firms' demand curve (dashed line) as on the market demand curve (solid line). Because the elasticity of demand is the same for each and for the monopolist, and marginal costs are the same, the three firms independently

choose the same price which equals the monopoly price. This congruence of interests on market shares facilitates the ability of each firm to set the price level of a monopolist in the market.

C. *Long-Distance Markets Exhibit Conditions Conducive to Tacit Collusion*

46. The conditions necessary for tacit collusion exist in long-distance telecommunications. The three large facilities-based carriers AT&T, MCI, and Sprint accounted for 87 percent of toll revenues in 1993.[38] Within specific classes of service, the three firms offer essentially identical packages of services under publicly available terms, thus satisfying the "homogeneous product" prerequisite. These firms' marginal costs are virtually identical: the access charges they pay to local exchange carriers are, by FCC policy, the same, and the remainder of costs incurred in day-to-day operations is also quite similar given their dedication to fiber-optic transmission systems. The barriers to entry are substantial given that the MFJ prevents the firms most likely to contest the market, the RBOCs, from providing long-distance interLATA services. The table summarizes the remarkable similarity of theoretical requirements with market structures in long-distance telecommunications.

MARKET CONDITIONS FACILITATING TACIT COLLUSION
IN LONG-DISTANCE TELECOMMUNICATIONS

Market Conditions	Long-Distance Telecommunications
Few Firms	Three Major Firms
Stable Market Shares	Market Shares Stable After 1990
Homogeneous Services	Similar Offerings for Each Type of Service
Firms with Similar Cost Levels	Access Costs Equal and Similar Operating Costs
Barriers to Entry	MFJ Prohibition on RBOC Entry

[38] LONG DISTANCE MARKET SHARES, *supra* note 21, tbl. 6.

47. Most important, relatively new conditions discourage rivalrous activity in the pricing of long-distance services, particularly after the "break" in concentration that occurs in the 1989 to 1990 period. As has been shown, HHI declined during the 1985-89 period and then stabilize after 1990. The "break" in the decline of HHI came about as a result of establishing stability in the individual shares of AT&T, MCI, and Sprint. The stability of shares along with the other "conducive" conditions, results in each of these firms facing demands with similar elasticities and, hence, provide each of the three interexchange carriers with strong incentives to choose the same price level in each of the various markets.

D. *Evidence from the Stock Market Supports the Hypothesis of Tacit Collusion in Long Distance Telecommunications*

48. The hypothesis that competitive pricing is absent from the interLATA market is strengthened by evidence from the stock market's reactions to AT&T's announced rate increases. In a market characterized by competitive pricing, no firm unilaterally would increase its price unless either (1) industry-wide costs had increased while demand remained stable or (2) demand increased and the industry had rising marginal costs (that is, decreasing returns to either firm or industry scale). In both cases, the firm's price would rise, but the firm still earns only the competitive rate of return. Any announced price increase in outputs would not cause the stock market to revise estimated returns on that company's shares and therefore that company's stock prices would not increase. Since other firms in that competitive market also earn only the competitive rate of return, the announced price increase should not cause their stock prices to rise either. But if there is no interfirm rivalry, and if competitors tacitly collude, the announced price increase should lead investors to anticipate further "matching" price increase announcements, and the stock prices of all three firms should increase. That is, an announced price increase by one firm should cause share prices of all three firms to rise.

49. I have documented the effects on stock prices of AT&T, MCI, and Sprint for five different announced price or rate increases by AT&T. The evidence is that the announced rate increases bring about concurrent increases in the stock prices for all three firms.[39] In particular, AT&T's announced rate increases cause an average increase of 3.4 percent in MCI's and Sprint's stock prices (net of any general movements in the stock market). As indicated below, this increase has a substantial effect on firms' combined total stock values.

[39] The effect of AT&T's announced rate increases on the capital market's evaluations of the profitability of MCI and Sprint was determined using a standard "event study" framework. *See* S. Brown & J. Warner, *Using Daily Stock Returns: The Case of Event Studies*, 14 J. FIN. ECON. 3 (1985). The event study examined the MCI and Sprint stock price reaction to announced AT&T rate increases while controlling for general market influences. For each rate increase, stock price and dividend data were collected for Sprint and MCI for the time period starting 200 days before and ending 10 days after the announcement. A portfolio consisting of MCI and Sprint stocks was formed, and daily returns were calculated based on stock price increases and dividend yields. Finally, the relationship between the portfolio's daily return and the daily return of the market (measured by the Standard & Poors 500 Index), and the long-term average portfolio return were estimated. Any portfolio returns unexplained by these two factors were defined to be abnormal returns, and any abnormal returns occurring around an AT&T rate increase announcement were attributed to the announcement. In order to capture the full effect on the announcement on the value of the portfolio, I chose the three-day interval beginning the day before the rate announcement through the day after the announcement. A detailed summary of my statistical findings is available upon request.

AVERAGE THREE-DAY ABNORMAL RETURN FOR MCI AND SPRINT
-- FROM AT&T RATE INCREASE ANNOUNCEMENTS

Announced AT&T Rate Increase	Increase in Market Value (millions of dollars)		
	Sprint	MCI	Total
October 23, 1990	$191	$242	$433
July 20, 1993	$391	$509	$900
September 17, 1993	$418	$524	$942
December 29, 1993	$385	$473	$858
January 25, 1994	$424	$510	$934
Average	$362	$452	$813

50. This table indicates that the increase in MCI and Sprint stock prices, not otherwise accounted for by market factors, translates into an increase in the two firms' combined equity values of more than $800 million after four of the five announced AT&T rate increases.[40] Such an increase in valuation suggests that the stock market views the interLATA market as less competitive,[41] and every one of the three firms is better off after AT&T raises its prices.

[40] This analysis was also conducted using a portfolio of AT&T, MCI, and Sprint. The results indicate that an announced AT&T rate increase produced an average equity value increase of $1.22 billion for the three-firm portfolio. However, the three-firm portfolio results in lower average cumulative excess returns for MCI and Sprint. Average cumulative excess returns to AT&T, MCI, and Sprint were $911 million, $171 million, and $137 Million, respectively.

[41] Both the Cournot and tacit collusion frameworks predict this observed change in MCI's and Sprint's equity valuation. Consequently, this evidence cannot be used to support one of these models of firm behavior over the other.